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East Europe Report

SCIENTIFIC AFFAIRS

No. 737

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CONTENTS

NEW COMPUTER 'IMKO-1' DESCRIBED

Production Begun

Sofia VECHERNI NOVINI in Bulgarian 19 Jan 82 p 1

[Text] "IMKO-1" is the first personal computer created by specialists from the Institute of Industrial Cybernetics and Robot Technology of BAN [Bulgarian Academy of Sciences].

Based on the "Intel 8080" microprocessor on a single large printed circuit, the computer has a keyboard with manual data input. The necessary information is received from an ordinary black-and-white television screen, and an ordinary casette recorder is used as a peripheral memory on magnetic tape. A printer and other auxiliary hardware can be connected to the computer.

"IMKO-1" can "control" machinery and industrial processes, as has been tested with a small painter robot, stepped and DC motors, and certain transducers.

The personal computer will also be used for instruction within the higher education system and for the goals of scientific organizations at home and abroad. But, "IMKO-1" is not only for scientists. It can offer television viewers amusing TV computer games. (BTA)

Some Uses Outlined

Sofia POGLED in Bulgarian 25 Jan 82 p 4

[Article by Sonya Aleksieva]

[Text] 19 January: "IMKO-1" is the first Bulgarian personal computer created by specialists at the Institute for Industrial Cybernetics and Robot Technology at BAN [Bulgarian Academy of Sciences]. (BTA)

It is interesting that at first the idea was greeted rather sceptically. Does it make sense to do it or not.... And it is even more interesting that now, after the announcement, institutes, organizations and laboratories from all over Bulgaria want to have the computer. The 50 "IMKO-1" which were

produced at the institute have already been distributed, but orders and telephone calls do not stop. Why is it thus? Let's take a look behind the 4 letters in the name.

They actually designate "individual microcomputer," individual in the sense that it is designated for independent use by a specialist at his place of work without being connected to some kind of center. Various tasks are given to it to be solved, depending on the computer's programs. Through an independent keyboard for manual data input, the representation of information and the results are seen on an ordinary television screen, and the programs can be recorded on casettes and stored when necessary. It is interesting to know that, in regard to design, "IMKO-1" has its own language, with which communication and program writing are facilitated. It is universal, like the large computers, but it is independent, table size, and can be used by non-specialists outside the area of computer technology.

One of the primary applications of "IMKO-1" is in education, particularly in higher education: This is why the people from this area expressed interest first. The computer insures the most successful means for instruction, particularly in computer technology. And why can it not serve for self-paced student instruction in the future? Other of its applications are in the machine control industry, during measuring processes, for computational activity in laboratories, for amateur radio.... Its application for logical and entertaining TV games is particularly interesting.

How do the computer's creators see some of the "brothers" of "IMKO" in the near future? It will be able to control, regulate and switch appliances on and off in the house; by connecting our homes with a computer center, we will be assured of any kind of information for which we have a need. Other devices will be connected to the computer, such as a printer, a drawing device and memory devices using flexible magnetic discs.

Engineer Kuncho DOSEV, one of the creators: "It took about half a year to develop IMKO-1. The result exceeds by many times the task imposed by the State Committee for Science and Technical Progress. We are satisfied. We had not created such a computer before!"

Engineer Ivan MARANGOZOV, head of the designer's collective: "'IMKO-1' will still show development because, naturally, we are finding out omissions and are making new variants to improve its characteristics. But the Bulgarian computer has capabilities as good as those of computers known to be in production worldwide. In general, this designation, the "personal computer," should be remembered by everyone because from now on it will play a part in our lives!"

Suggestions to create a separate unit for personal computers have already been made within the institute. There is an understanding and support; the process of setting it up is spoken of, but in practice, this unit still does not exist. And it should, so that in the near future we can have the following "IMKO-2, 3, 5, 12, 19, 24..." and connect to them devices to compute, to control, to instruct, to inform, to....paint, and whatever else we need in our everyday lives at work and at home. But who can foresee the rapid development of electronics in the future?

9194
CSO: 2202/8

BRIEFS

NEW MICROPROCESSOR SYSTEMS PRODUCED--Production of 2 new microprocessor systems began at the "Orgtekhnika" combine. "Izot 1003" is oriented toward solving questions of material and technical supply and control of warehousing operations at enterprises and organizations. One of its great advantages is that it can be connected to a minicomputer and, thus, the systems can encompass not only enterprises but large economic entities as well. The "Izot 1005" is designed to solve questions for the State Savings Bank, and it can process input and output information thoroughly. This system is considered universal because it is also oriented toward processing of economic data. Thirty "Izot 1003" systems will be produced by the end of the month, and 50 "Izot 1005"s by the end of February. The anticipated expansions of production will permit import of similar systems to be curtailed. (BTA) [Text] [Sofia VECHERNI NOVINI in Bulgarian 19 Jan 82 p 1] 9194

CSO: 2202/8

UNDERGROUND COMMUNICATION CABLE-LAYING NORMS, PROTECTION DISCUSSED

Importance of Telecommunications Protection

Prague TELEKOMUNIKACE in Czech No 12 1981 p 177

[Article by Eng Alois Myslivecek, Federal Ministry of Communications: "Importance of Protection of Telecommunications"]

[Text] The quality of services in the sector of telecommunications depends primarily on the ability of the telecommunication network to respond instantly to the demand for transfer of information, which demands, among other things, highly reliable equipment and lines that constitute the telecommunications network, as well as the achievement of the lowest possible rate of breakdowns in every section of the networks.

During the fifth and sixth five-year plans, the telecommunications network considerably expanded its services and distinctly improved their quality. Measures to cut the rate of breakdowns played an important role by focusing on the prevention of breakdowns and on their prompt repair whenever they occurred. Numerous data may confirm that the measures adopted to reduce the rate of breakdowns indubitably demonstrated a positive effect on better quality of the services offered to our organizations and citizens.

In the early 1970's, local and toll cables very negatively affected the ultimate quality of the unified telecommunications network and, therefore, several measures were adopted and implemented to improve the situation and, among other things, to protect telecommunications as well. With the approval of the Federal Ministry of the Interior and of the General Prosecutor's Office of the CSSR, the Federal Ministry of Communications issued in 1971 the Directive for Protection of Underground Telecommunication Lines (Cables) and Equipment from Damages Caused by External Intervention. This directive played its role, as confirmed by the development of the rate of external intervention beginning in 1973.

The changes in legal regulations for the sector of capital investment and the necessity to define precisely the obligation to protect underground telecommunications by generally obligatory legal regulations prompted the issuance in 1978 of the Decree on Protection of Underground Telecommunication Lines and Equipment Against Damages Caused by External Intervention regulated

operations of telecommunications organizations for protection of underground telecommunications and the steps to be taken after cables were damaged. The Federal Administration of Public Security was instrumental in issuing a handbook for members of the Public Security investigating and searching for cases of such damages. Other information resulted in an order to telecommunications organizations to submit all juridical decisions concerning fines to organizations of the prosecution for investigation whether the organization penalized the employees in charge and, thus, duly observed legal regulations. Finally, instructions were issued on compensation for profits lost due to damages caused to underground telecommunications by organizations due to gross dereliction of their duties.

Nevertheless, it is not the measures issued, but rather the results achieved by their implementation which are a matter of vital importance. The rate of damages to underground cables was gradually reduced. In 1971, 2,200 such cases were reported, in 1980 only 1,450 despite the fact that in both preceding five-year plans the cable network had been considerably expanded. The volume of imposed sanctions confirms that the demands and thoroughness of the prosecution increased step by step: in the Fifth Five-Year Plan fines totaling Kcs 30.6 million were collected for a total of 10,200 damages and transferred to the state budget; during the Sixth Five-Year Plan they amounted to as much as Kcs 67.6 million for 8,300 damages. The above-mentioned development was reflected positively in a lower rate of breakdowns in telecommunications. Thus, for instance, the rate of operational breakdowns in the toll cable network caused by external intervention gradually declined. In 1976, it amounted to 8.4 breakdowns per 1,000 km of cables but in 1980 to 5.4 breakdowns caused by external intervention.

Among several teams and employees of telecommunications organizations who deserve credit for their good accomplishments in protecting telecommunications are agents of state inspection of telecommunications, who are not lawyers and who conduct administrative investigation in okres telecommunications administration and who impose fines, as well as lawyers and many technical and engineering employees of telecommunications organizations. Because even strict fines and other sanctions often fail to teach an appropriate lesson and because some organizations still systematically damage underground telecommunications, the updated announcement No 111/1964 of the Collection of Laws proposed that the fines be raised in cases where the same organization has caused damage for the second time to underground telecommunications within a specifically outlined location over a brief period of time. Moreover, under consideration are fines to be imposed upon certain employees of organizations or citizens for damages caused to underground telecommunications; such fines would be in the form of penalties for misdemeanor. A supplement to the law on misdemeanors which was proposed to this effect is now being drafted.

All such measures notwithstanding, damages caused to underground telecommunications continue to pose a serious problem. External interventions were responsible for about 50 to 60 percent of all breakdowns in operations of toll networks and 20 percent of breakdowns in local networks. This represents a significant cause of breakdowns in toll networks and a significant cause of breakdowns in local networks. It is a very important fact that external

interventions frequently put cables completely out of service for a certain period, not to mention that the value and quality of the damaged cable are permanently diminished.

Any further improvement of the quality of services in telecommunications depends, therefore, on our success in effectively reducing the rate of damages caused to cables by external interventions. Telecommunications organizations must focus all means of prevention and prosecution on this goal and seek more opportunities to upgrade protection of telecommunications. Furthermore, telecommunications organizations must plan new cable line better and reconstruct the existing cables so as to improve their protection. In addition, the quality of construction and assembly work must be upgraded and completed projects must be scrupulously inspected to assure high quality of the delivered cable lines before putting them into service. No longer can the management take over any cable laid with inadequate covering or which is otherwise defective. Moreover, telecommunications organizations absolutely must be more determined to prevent damages to cables during construction and assembly operations.

The above-mentioned clusters of questions call for an uncompromising approach by the management of telecommunications organizations because further improvement of the quality of telecommunications is closely connected with the protection of their underground lines.

Regulations for Underground Communication Lines

Prague TELEKOMUNIKACE in Czech No 12 1981 pp 187-188

[Article by Eng Vladislav Skalak, Research Institute for Telecommunications: "Regulations for Underground Communication Lines"]

[Text] While reviewing regulations for electrical engineering, one of the norms in need of specification was CSN 22 4050 Regulations for Underground Communication Lines. The title of that norm was quoted in several documents on standardization under CSN 34 2200, however, that norm was never fully defined. At present that norm is among those submitted for approval to the Bureau for Normalization and Measurements, and its issuance is scheduled for 1982. Its contents are briefly outlined and several deviations from the existing usage are presented here so that the workers in the telecommunications department may immediately apply this norm.

The norm is applicable in planning and construction of underground communication lines. It deals with connecting with and crossings those lines with underground communications and other underground lines. The norm stipulates safe and cost-efficient construction of underground lines designated for communication and noncommunication purposes in conjunction with other types of surface and tunneled communication lines.

Underground Relay and Nonrelay Communication Lines

According to the norm, we divide underground communication lines into communication lines in a unified communications network--relay lines--and into underground information lines laid and operated outside the unified telecommunications network--nonrelay lines. Nonrelay underground lines are laid by organizations of other ministries
--by authorization according to special regulations in agreement with organizations of communications.
--upon permit by communications organizations.

According to the type of operation, there are local and toll underground communication lines. In the sense of this norm, the operator of the underground communication lines, relay or nonrelay, determines whether the lines are local or toll.

The Route of Underground Communication Lines in Communities

On covered territories of towns (communities) and on territory designated for construction, underground communication lines are laid in an open ground, in the sidewalk along the curb and in premises adjoining local and special communications. The placement of such lines is determined by their position, by the minimum permissible horizontal distance from the parallel line, by the minimum permissible vertical distance between crossed lines, and by the minimum permissible covering. Underground communication lines consist mainly of cables which are laid:
a) in the ground in open terrain and in premises adjoining local and special communication;
b) in the ground in the area of the sidewalk;
--behind the foundations of pillars in the direction toward the areas with buildings;
--along the inside of the curb;
c) in cable ducts which are
--deep-set
--on the surface;
d) in cable and transit ducts;
e) in collectors.

So long as the communication cables are not laid in cable ducts, collectors or cable tunnels, they are placed in the open ground, in the sidewalk along the curb, or in the non reinforced part of the space adjoining the communications, namely, in a single tier with a minimum permissible cover according to Table 1. Where they cannot be covered in this manner and where the cable may be weighted mechanically, it must be protected by additional mechanical means, for instance, by encasing it in appropriate protective coating. This additional mechanical protection and the omission of the required covering must be specifically indicated in the documentation. This regulation is important most of all for operators and maintenance workers because information concerning any variance in cable laying is helpful when breakdowns are repaired, and specifies the location of communication cables for other organizations.

Table 1.

Cable	Minimum permissible cover (m)	
	Sidewalk	Open ground, entry under 6 m
local	0.4*	0.6
toll	0.5	0.6

*When laid jointly, local and toll cables are laid under 0.5 m cover.

In crossing underground communication lines with more than 6 m entry in the project, the underground communication cable is covered as in the transposition of communications, i.e., protective coating, for instance, is used. In the entry area, no underground cable equipment (such as coupling, loading-coil cable, dummy section) may be placed. A supplementary line of asbestos-cement, PVC (concrete covered) or concrete pipes with weighted wire is built near the coating of the toll cables as well as of local cables in justified cases. The minimum permissible cover of cable ducts, cable and transit channels, coating, etc. is presented in Table 2.

Table 2.

Communication line	Minimum permissible cover (m)			
	Open ground	Roadway	Arable lands and meadows	
			Land reclamation	No land reclamation
Local and toll cables	0.6	0.9	0.6	0.9
Transit tunnels, coating	-	0.9*	-	-

*The minimum cover for superhighways, first-class highways and highways for motor vehicles is 1.2 m.

An interesting part [of the norm] further states that no other equipment, buildings, etc. not immediately connected with the operations of communication cables laid in that line, can be laid within that entire line of unprotected underground communication cables.

The tunnels along the entire line of underground communication cables are always covered with bricks or other covering material. Simultaneously warning foil is laid along its whole length. The maximum permissible cover for communication cable is 1.5 m, except in special cases justified in the plan.

Line of Underground Communication Cables in the Countryside

The line of underground communication cables outside areas covered with buildings is selected pursuant to the following criteria:
--it must be fully accessible for easy maintenance of communication lines;
--operations, such as ditch digging, cable laying, installation of equipment

and ground work, as much as possible must be performed mechanically;
--the cable and the equipment must be exposed to the minimum to elements that may harm or disrupt the equipment internally or externally, to overload, corrosion, etc.

So long as the communication cables are not intended for the needs of highways and superhighways, they must not be placed in the body of highway routes and on highway lands, unless it is a matter of crossing that route. Exceptions are permitted by the Federal Ministry of Transportation in case of superhighways, and in case of highways by the Ministry of the Interior of the CSSR, the Administration of Transportation, and the respective ministry of the SSR, Administration of Transportation.

Underground communication cables outside areas covered with buildings are laid with a minimum permissible cover according to Table 2. Along the entire line of the communication cable, warning foil is laid manually, except for areas with a declivity of more than 20 percent. Bricks and other cover material are placed only over couplings, coil cases, junctions, etc. The stipulated maximum cover is given as 1.5 m.

When selecting the line for underground communication cable in an open area, forest roads (used as access roads) and wetlands, as well as areas with highly unstable soil and water, areas with erratic streams and mining areas must be avoided. If undermined areas cannot be avoided, the cable must be rippled while being laid and cables with higher tensile strength should be used. In areas where the level of underground waters is higher than the depth of the cable line, or where water may flood the cable, the plan must include a cable with passive protection against corrosion, or the cable may be furnished with active protection.

In its next section, the norm stipulated the conditions for cable-laying, such as the radii of bend, the permissible laying temperature, and methods for laying of cables in an open ditch, with laying equipment, on bridges, on the bottom of river beds, etc. Pull-in cables are led only in cable ducts with continuous passive protection. A single cable is pulled into each opening. Upon an agreement of the operator of the cable line and of the manager of cable ducts, more cables may be pulled in, however, this does not apply to radio frequency cables and to cables with long-distance feeding; telephone cables must be laid jointly with wire cables.

Laying of Cables in Transit Tunnels of Underground Communications

The newly coined term "transit tunnel" refers to an impervious space which is enclosed by buildings and which serves for laying of communication cables, particularly in crossing underground communication lines, water streams, etc.

Transit tunnels are established whenever possible during the construction of a communication line, namely, perpendicularly to its axis, with no more than 6 openings. After agreement they are built by extrusion, tunneling, or open cross-tunnel, with a minimum cover according to Table 2, for example, from

asbestos-covered, concrete or PVC pipes of at least 150 mm inner diameter. The coating must be long enough to make its ends accessible for the intrusion or a change of the cable without impairing the construction of the roadway proper. If the end of the transit cable is not freely accessible, cable chambers must be built at each end.

At present, a potential change of the minimum permissible cover of toll cables is under discussion at the Federal Ministry of Communications but thus far it has not been incorporated in the norm.

When seating the cable, the minimum total length of the transit tunnel is 35 m for PVC pipes and 25 m for the norm.

For a longer transit, a cable duct, including cable chambers, or a cable tunnel is built and a cable protected against corrosion is pulled in. The same rule applies to the requirement of more than six openings. Along with the construction of transit tunnels for surface communications, a supplementary line is provided for communication cables. It includes spare openings with the same permeability or supplementary permeability as the other line.

The next part of the norm describes the process of laying local and toll cables together, and the construction of cable ducts, which follows the ministry's regulation "Communication Cable Ducts," however, it is also considered that other ministries may build their own cable ducts.

Crossing and Connecting with Underground Lines

A very extensive section involves crossing and connecting with underground communication lines one with another, with underground communications, with other lines, with channeled communication lines and water flows. As distances between individual lines we understand the distances between their external surfaces, coating, etc. In connecting and crossing, a protected communication cable is laid in a brick tunnel, concrete or asbestos pipe or is pulled in a cable duct. The minimum permissible vertical and horizontal distances between the communication cables and other underground lines are presented in Table 3, and those of cable ducts with underground lines in Table 4. In crossing and connecting cable ducts with thermal pipelines, caution is needed so as to avoid exceeding the air temperature in the cable duct and cable chambers over 25^{o} C. The norm specifies that warning foil be placed in full width along the entire line. The same requirement will be stipulated in the supplement to current CSN 73#6006 of Designations of the Equipment for Laying of Warning Foils. At the same time certain changes have been introduced in current norm CSN 73#6005 on Spatial Arrangements of the Lines of Technological Facilities; however, they will be incorporated in the norm during its revision.

In conclusion, the norm lists related Czechoslovak norms, administrative and other regulations as well as terminology. As it follows from the norm, it offers a solution for connecting and crossing of communication cables with other communication lines operated by the administration of communications, as well as connecting and crossing communication cables built by other ministries with other operators or managers of underground networks, underground communication lines, water streams, etc.

Table 3

Type of line	Communication cable			
	Crossing (m)		Connecting (m)	
	Mechanical		Mechanical	
	Protected	Unprotected	Protected	Unprotected
Cables	0.07	-	0.07	-
Tube Post	-	0.2	-	0.2
Cable ducts	-	0.1	-	0.3
Power cables				
under 1 kV	0.1	0.3	0.1	0.3
over 1 kV	0.3	0.8	0.3	0.8
Amelioration trench	-	0.7	-	0.5
Irrigation pipeline	-	0.2	1.0	2.0
Main drain	-	0.2	-	0.5
Gas pipelines				
under 100 kPa	0.1	-	-	0.4
over 10 MPa	0.5	-	-	3.0
Water pipeline	-	0.2	-	0.4
Thermal lines				
steam	0.25[1]	0.5[1]	0.8[2]	2.0
water	0.15[1]	0.5	0.3[1]	0.8
Long-distance pipelines for inflammable liquids	0.5	-	-	3.0
Oxygen lines, acetylene lines	0.1	-	-	0.5
Collectors, technical tunnels, cable tunnels	-	0.1	-	0.3
Drains, sewage mains	0.1	0.2	-	0.5

1 Applies when thermal protection for thermal lines is used
2 Applies for short concurrence of 200 m.
3 Applies for walls of cable chambers, or as the case may be, for the cable duct body.

Table 4

Type of line	Cable duct	
	Crossing (m)	Connecting (m)
DR cable	0.1	0.3
Tube post	0.2	0.2
Power cables		
under 1 kV	0.1	0.1
over 1 kV	0.3	0.3
Gas pipelines		
under 100 kPa	0.1	0.4
over 10 MPa	0.1	1.0

[continued]

[Table 4 - continued]

Water mains	0.2	0.6
Thermal pipelines	0.15	0.3
Collectors, technical tunnels, cable tunnels	0.2	0.3
Drains, sewage mains	0.1	0.3

9004
CSO: 2402/21

NEW LIVESTOCK FEED MIXTURE TO SAVE GRAIN

Bratislava PRACA in Slovak 10 Feb 82 p 4

[Article by Luba Soskova: "Experiment with a New Feed Mixture - Scientists to Workers in Agriculture"]

[Text] "In 1980 there were 22 districts in which more than 4 kg of feed concentrates were used per kilogram of meat from fattened hogs. There are also districts which achieved the same results with 3.6 kg, though. By reducing the consumption of feed to this level we would save more than 100,000 tons of feed concentrates per year", stated Frantisek Pitra, Secretary of the CPCZ Central Committee, in the CPCZ Central Committee Presidium report on the tasks in development of agriculture and food production presented at the 4th session of the CPCZ Central Committee.

Not only farmers from agricultural cooperatives and state farms, but also numerous research workers are trying to find ways to work as really good husbandmen in agriculture. Paradoxically, it is often hard to find people willing to implement good ideas of scientists in this field.

Among those who did not get discouraged by the initial difficulties are Prof Eng Stefan Ivanko, Dr Sc., head of the Biochemistry and Agricultural Chemistry Department of the Veterinary College in Kosice, and his fellow-worker Dr Ladislav Vasko, CSc. These scientists together with the employees of the Kosice branch of the Central Agricultural Institute for Control and Testing (UKSUP) in Bratislava are currently working on a state task.

- Our task within the framework of the protein program solution was to replace imported soybeans and animal proteins for hog fattening by indigenous raw materials. This would result in a substantial reduction of soybean imports, and animal proteins produced in this country (bone meal) would be sufficient for poultry and for hogs in lower weight categories.

How Much Do Soybeans Cost?

Last year the CSSR imported protein concentrates for approximately Kcs 3 billion in hard currency. Soybeans formed a substantial part of the imported raw materials.

The agricultural purchasing-supplying enterprise in Kosice furnishes agriculturists in east Slovakia also with soybean meal required for manufacture of feed mixtures. Last year 47,000 tons of ground soybeans were imported just to this region. The suppliers from Brazil, India, and the United States were paid almost Kcs 20 million for the soybean meal shipments.

Just these few figures indicate that a replacement of soybeans by other fodder components would be advantageous to our agriculture.

--Our research was based on a decision concerning what crops it was possible to grow in our country, and in what amounts. Instead of soybeans and animal proteins we started adding peas, sunflower seeds and alfalfa in specified ratios to classical components, i.e. wheat, corn, and barley. These components were modified till the fodder portion contained an optimal proportion of amino acids.

Becoming a Partner

The experiment--feeding hogs plant fodder (VOR)--was tested in The First of May Unified Agricultural Cooperative (JRD) in Buzica, in one of the rural districts of Kosice. People working in this JRD were good fellow-workers and more than dependable partners. The tests were started on 1 Jul 1981, using 60 hogs. The first results, from the end of September and the beginning of October, were more favorable than expected.

Thus our first and foremost task was to replace imported fodder components by domestic ones, ensuring that the results would not be worse than those achieved with imported feeds. In the East Slovakia Kraj the average daily weight increase of a fattening hog amounts to 490 g. Feeding hogs with our fodder mixture, we have achieved a daily weight increase of 680 g, consuming 3.8 kg of feed mixture per kilogram of weight increase.

The VOR feed mixture gave better results than the best, choice VULIN feed mixture. VULIN contains 6 percent soybeans, 1.5 percent animal proteins, and when employed it results in daily weight increases of 660 g at a consumption of 3.90 kg of feed mixture per kilogram of weight increase.

Selecting the composition of the new feed mixture was based on the available possibilities in the CSSR. The legumes which have been used may be grown everywhere in our country, and experience has shown that these plants ripen even in inclement weather. Agricultural workers achieving good results in fattening of hogs could improve the daily hog weight increase at least by 100 g when using the new feed. (Moreover, they could take a big step toward self-sufficiency. Including legumes in the sowing cycle would result in an improvement of soil, both in its structure and its nitrogen content, which would favorably influence the subsequent crops.

However, agricultural equipment is the key problem here. The agriculturists have no machinery for sowing and harvesting legumes.

Research Continues

The mentioned higher weight increases are connected with a reduced feed consumption, and a shortened fattening time, approximately by one third. And perhaps it is not even necessary to point out that the production of fattened hogs would be substantially less expensive. These facts make the Kosice scientists continue in the started research, double-checking its results in the field.

In January the second part of research was launched, again in cooperation with the Buzice collective farm workers. The feeding portion is being tested on 200 hogs.

The multilevel fattening pigpen with a capacity of 5,000 heads of fattening hogs is fully automated (feeding, watering, removal of dung, etc.) Preliminary results have been favorable. We would like to expand our research also to other agricultural enterprises, so that by the end of the year we could say a decisive word in solving this important task.

9910
CSO: 2402/29

BRIEFS

AERIAL SURVEY EXPERIMENT BEGINS--First joint Czechoslovak-Soviet aerial survey experiment using a Soviet AN-30 flying laboratory has been underway in the CSSR since 9 March. Based on the CSSR-USSR intergovernmental agreement on aerial survey cooperation and an invitation by the Czech Geodetic and Cartographic Office, the USSR State Committee for Hydrometeorology and Environmental Control sent a team of five scientists. Several Czechoslovak state and scientific institutions are participating in the experiment which should be completed on 29 March. The Soviet AN-30 airplane is equipped with a multispectral MKF-6 camera the Vulkan thermovisual system and other state of the art apparatus. Most extensive photography has taken place in the East Slovakia flats, which will facilitate accurate assessment of agricultural land inundation. Photographs taken from 6 km above ground will offer new information on geomorphology of the volcanic-origin ranges in Central and East Slovakia. Multispectral and thermal photographs of selected location important from the viewpoint of the Czechoslovak agriculture, forestry, water resources, geology and cartography will be taken. [Bratislava PRACA in Slovak 26 Mar 82 p 2]

TRANSISTORS PRODUCED BY HANOI--The Hanoi Plant for Production of Transistors, which originated as extension of the Research Institute of Electronics [Vietnam], had produced about 500,000 transistors annually prior to its cooperation with the CSSR. The cooperation agreement was signed between the CSSR foreign trade establishment Kovo and Vietnam's Machinoexport in 1979. Subsequently, two large groups of Vietnamese were trained at Tesla factory in Piestany, CSSR, and Czechoslovak technicians arrived in Vietnam to help with installation and operation of several transistor production lines. During the first year of the cooperation, the plant produced 4 million transistors from semifinished products imported from the CSSR. In 1982, production of 5 million is expected and 6 million annually during the 1983-1986 period. Imports of the semifinished products from the CSSR will be gradually replaced with Vietnamese products. The cooperation will eventually include assembly and production of final products such as blank-and-white television sets and radio/tape recorder sets. [Prague RUDE PRAVO in Czech 13 Mar 82 p 6]

CSO: 2402/40

LONG-TERM DEVELOPMENT OF AUTOMATION STUDIED BY COMMITTEE

Budapest MUSZAKI ELET in Hungarian 21 Jan 82 pp 9-14

[A study of the National Technical Development Committee (OMFB): "Long-Term Development of Hungarian Automatics Industry Activities"]

[Excerpts] The conception embraces the direction of and the conditions for the development of Hungarian automatics industry activities up to 1990 based on the expected development and on user needs, taking into consideration the long-range tasks of the machine industry (structure, economicalness, export) and the expectations of the national economy. A separate conception titled "The Long-Term Development of Automation in Hungary" deals with questions of automation from the user side. This conception was published in the previous issue. The two conceptions supplement one another and offer a manysided overview of the problems of domestic automation.

The OMFB has prepared a new, modernized conception for the manufacture of automation devices for the period up to 1990 covering the long-term development of "automatics industry" activities in the instrument, communications, strong current and precision engineering subbranches.

This technical-economic conception embraces the most important goals or viewpoints and methods necessary for a selection from among automation systems and devices of those appropriate for domestic development and manufacture or to satisfy domestic or export needs. In addition it makes recommendations regarding what automation services should be further developed. At the same time it examines which complete domestic systems should be developed for the automation of which economic branches, technological systems, etc, which should be modernized, and how to satisfy demand in harmony with the integration policy, that is, in what ratios it is proper to rely on imports. In the course of this fundamental consideration was given to the findings of OMFB conception No 14-7201 titled "Long-Term Development and Tasks of Automation in Hungary," which deals with the question of the ever broader application of automation equipment.

Domestic Demand and Export Possibilities

Demand for automation devices is made up of three main groups:

--the needs of national economic investments (large investments, housing construction, etc);

--equipment needed for machine industry products (producer use, largely for indirect export); and

--products for direct export.

In addition there is a demand for automation devices for renovation and for consumer goods, representing a relatively small value (but one which must be considered); this comes to 2-3 percent of all domestic use.

The technical-economic needs of the user side can be summarized briefly as follows.

Domestic production is not a requirement in the area of elements built into automatic systems, but the growth in user demand may make possible the manufacture of more economical series and may lead to more reliable, more developed products which may also be more competitive on international markets.

It would be appropriate to ensure devices not manufactured domestically from stocks of elements constantly acquired and stockpiled from relationships stabilized for a long period (via long-term contracts or cooperation deals). Import acquisitions, stockpiles and guaranteed variety must be determined with a well thought out and harmonized foreign trade and industrial policy, not least of all with an automation conception in harmony with long-range thinking.

The automatics industry activity necessary for automation of domestic investments should extend to complete domestic deliveries in selectively chosen areas; in other areas it should extend primarily to system design, prime contracting, assembly, installation and service work. This should be undertaken as part of cooperation in imported automation systems, as equal partners in the area of cooperation deals based on mutual interests making use of imported automation equipment or technological equipment.

Enterprises conducting automatics industry activities must realize considerable import savings and significant export, primarily by ensuring the modernness of machine industry products, by automation of certain technologies, mechanical equipment, etc., but also through independent, direct deliveries. Export and cooperation deliveries can be expected to provide economical foreign exchange acquisition possibilities of significant magnitude. In the interest of a proper evaluation of the role of enterprises conducting automatics industry activity in improving the capitalist balance it is necessary to take into consideration more precisely than heretofore indirect export and import savings.

The resource use balance forecast in the conception was prepared on the basis of the following use data.

Separate OMFB studies have detailed the demand volume pertaining to complete automation equipment for the investments of the national economy and the export automatics content of the machine industry. The volume of automatics industry products forecast for producer use (indirect export) was calculated by making use of the data from the study used as a base. The development of direct automatics export to be expected up to 1990 had to be estimated. Taking into

consideration the expected growth in CEMA integration and the efforts directed at increasing capitalist export a strong export orientation seems realistic for the period up to 1990.

Even thus far socialist export has been of great significance. Some of these products in the Soviet relationship have been used to pay for oil.

Direct automatics export in the dollar relationship has shown slow growth thus far. A gradual improvement in the dollar-ruble export ratio must be achieved in the long term, because without this the development of automatics industry activities cannot be ensured. The conditions for capitalist export (references, service, customer service, economical series size, a cheap and broad variety of elements) can be produced primarily with the aid of appropriate capitalist cooperation or license purchases or by the manufacture of special products, manufactured by few and thus in demand, and can be ensured only with hard market work.

We can count on a more vigorous growth of capitalist export in the years ahead, primarily by developing production cooperation between Hungarian and capitalist firms and by setting up joint undertakings. Thus, the conception predicts the achievement by 1990 of a ruble/dollar export ratio of about 3:1 as compared to about 10:1 at present (capitalist export will grow from 5 percent of production to 18 percent of production). We can count primarily on the export of complete systems or on cooperation deals, examples being the sport results displays and light information equipment of the VBKM [Electrical Equipment and Appliances Works], the gas and oil industry automatic equipment of MMG-AM [the Automatics Works of the Mechanical Measuring Instruments Factory], the machine industry manufacturing control and supervision equipment of VILATI [Institute of Electrical Automation] and certain process control equipment.

But a significant expansion of capitalist export will require meeting the following conditions or an appropriate solution of the following problems:

--technical representation in the customer countries, creation of a consulting and business organization, and organizing services and a customer service;

--making domestic foreign trade more flexible;

--improving the export work of enterprises conducting automatics industry activity (guaranteed time limits and quality), giving them independent export rights;

--creating joint enterprises with capitalist firms in some areas; and

--a substantial shortening of travel authorization procedures and those for providing foreign exchange, etc, for personnel performing services and for providing the necessary tools.

When studying total values in regard to demand one must also consider the effect of technical development on prices. In this connection one must reckon with the influence of the following factors:

a. Miniaturization is a general trend, as a result the specific material use for automation equipment is decreasing;

b. Electronics are increasingly dominant in equipment manufacture (integrated circuits), series size is increasing; as a result of these factors the cost of the electronics hardware needed to carry out a specific automation task is decreasing;

c. The sphere in which precision engineering devices are used is shrinking but the lowering of prices for these can be expected to be much slower than for electronic devices;

d. The cost of related services (design, software, installation) is increasing with the growth in the complexity of automated systems; this increases the ratio of intellectual work used; and

e. The sphere of tasks which can be automated economically is expanding within the same technology; as a result of this the cost for automating a given technology increases if all the possibilities are used.

Possibilities and Conditions

Domestic manufacture of automation devices has grown dynamically in recent years. This dynamic development can be explained partly by the modernization of products and making manufacture more economical and partly by the introduction of new capacity which previously produced other products. The ratios of the activities necessary for the manufacture of automation devices has been changing also. As a result of the ever broader use of microelectronic devices the assembly character of manufacture is increasingly preponderant in the automatics industry, while parts which can be used in a broad sphere are produced by jobwork or service plants.

Taking these points into consideration one can expect a production growth exceeding the machine industry average in the period extending to 1990, and the conception takes this into account.

On the basis of the hypothesized market possibilities domestic production of automatics will satisfy export and a part of domestic use.

The larger part of domestic needs (about 60 percent) will be met from imports. This trend is justified by the fact that the broad scale of user needs can be satisfied economically primarily from imports, but it is also justified by the export orientation of domestic automatics industry activity. In the event of the realization of the conception capitalist import by 1990 will be only one-third of the import in the socialist relationship as compared to the present ratio (which is greater than one). And the capitalist balance can be equalized by 1990.

A preliminary study of the conditions for realization has shown that there will be a need for credits for both technological development and to develop working assets.

Enterprises Conducting Automatics Industry Activity

The following enterprises deal or will deal with the development and production of the great majority of automatic systems and necessary elements which are important from the viewpoint of long-range development and thus the conception has studied them primarily. (They are designated by "manufacturing branch" according to the Central Statistics Office and by Industrial Products Registry [ITJ] number.)

Automatics industry activity is conducted by the following enterprises belonging to the "manufacture of structural machine elements branch (1411-020):

--the DANUVIA Central Tool and Device Factory (hydraulic automatics, ITJ 31-3);

--the Ujpest Machine Elements Factory (hydraulic automatics, ITJ 31-3);

Automatics industry activity is conducted by the following enterprises belonging to the "manufacture of guidance technology products and equipment' branch (1451-065):

--The Electronic Measuring Instruments Factory (EMG) (measurement automatics and other automatic equipment, ITJ 48-5/6);

--the United Electric Motor Factory (EVIG) (controls for electric motors, ITJ 48-1/2, 48-6/7 and strong current automatics belonging in groups ITJ 42-15 and ITJ 42-34);

--the Precision Mountings Factory in Eger (pneumatic automatics, ITJ 48-3);

--the GAMMA Works (nuclear power plant and industrial thermal technology controls, hydrological automatics and elements, ITJ 48-1, 48-6/7 and strong current automatics belonging in group ITJ 42-15);

--the GANZ Instrument Works (GMM) (electric power and utilities controls, ITJ 48-1/2 and automation instruments belonging in group ITJ 47);

--the GANZ Electric Works (GVM) (controls for railway vehicles, electric motors and driving mechanisms, railway safety and railway traffic automatics, ITJ 48-1/2, 48-6/7);

--the MMG Automatics Works (MMG-AM) (gas and oil pipeline automatics, fire alarm equipment and elements, ITJ 48-2/8, and automation devices belonging in groups ITJ 47 and ITJ 27);

--the Chemical Works Construction and Outfitting Enterprise (VEGYEPSZER) (chemical industry automatic equipment, ITJ 48-6 and automation instruments belonging in group ITJ 47);

--VIDEOTON (VT) (computer systems, ITJ 48-6);

--The Electric Equipment and Apparatus Works (VBKM) (electric driving mechanism controls, light display equipment and other automatic equipment and elements, ITJ 48-1/2, 48-6/7, and strong current automatics belonging in group ITJ 42-3);

--The Electric Automatics Prime Contracting and Manufacturing Enterprise (VILATI) (driving mechanism and process control and other automatics equipment, ITJ 48-6/7).

Automatics industry activity is conducted by the following enterprises belonging to the "manufacture of measuring instruments and devices" branch (1451-057):

--the Laboratory Instrument Industry Works (LMIM) (automated equipment, ITJ 47);

--the Hungarian Optical Works (MOM) (automated laboratory devices and instruments, ITJ 47);

--the [illegible] Scale Factory in Hodmezovasarhely (automatic scales, ITJ 47);

--the RADELKIS Electrochemical Instruments Manufacturing Cooperative (automated electrochemical instruments, ITJ 47);

The following research and development institutes are primarily active in the area of automation:

--the MTA Computer Technology and Automation Research Institute (SZTAKI);

--the MTA Central Physics Research Institute (KFKI);

--the Instrument Industry Research Institute (MIKI);

--the Electric Industry Research Institute (VKI);

--the Electric Power Industry Research Institute (VEIKI).

The developmental facilities (institutes) of the manufacturing enterprises listed in the first part of this point carry out significant automatics development.

The research institutes of other branches, the automation sections of several technological planning institutes, university and college faculties and other enterprise developmental facilities also conduct automatics development.

The following enterprises are engaged in installation of automatics:

--the Budapest Petroleum Industry Machine Factory (BKG);

--the Pipe Fitting Industry Enterprise (CSOSZER);

--the Light Industry Assembly and Building Maintenance Enterprise (KIPSZER);

--the Electric Assembly Industry Enterprise (VIV);

--the Electric Power Plant Planning and Assembly Enterprise (VERTESZ).

The Justification for Domestic Development

The analysis done in connection with the setting of long-range developmental tasks--in accordance with methodological guiding principles accepted for selective product structure studies--and which pertains to the economic structure of domestic automatics industry activity and a definition of its place and role in the branches and in the national economy indicates the following:

a. In regard to production not one of the domestic enterprises manufacturing automation devices manufactures automation devices exclusively. The MMG-AM and VILATI manufacture more than 40 percent of the production. The Precision Mountings Factory and the VBKM also manufacture a relatively greater volume of automatic devices, but the manufacture of automatic devices makes up only 10-20 percent of their production.

From the point of view of scale of series size the production volume which can be manufactured in a single product:

--The situation is relatively favorable for about 30-40 percent of the products. Market competitors of a size similar to the domestic enterprises do not manufacture these in larger series, and this will probably continue to be the case (this is true primarily in the case of automatic equipment); the situation is especially favorable for CEMA specializations, in the manufacture of equipment supported by production cooperation agreements;

--For about one-third of the production the scale is near the international average but it would be desirable to narrow the selection in order to increase competitiveness. This can be prescribed over the long term by increasing international cooperation;

--For about 10-20 percent of the products the scale is unfavorable; manufacture might be gradually phased out in a planned way as a function of systematic, long-term socialist import or capitalist cooperation under suitable conditions.

The capital and intellectual concentration of our larger domestic enterprises dealing with the manufacture of automation devices which they direct at complex automation undertakings is suitable, in the case of each separately, only for small production tasks. It will be necessary to create a concentration of capital and intellectual resources of a size suitable for the undertaking of complex tasks of larger volume which can be expected to appear in an ever-increasing ratio in the future--and which can be predicted as a probable area for economical export in the non-ruble relationship also. There is a possibility for this and it can be realized as the combined effect of the economic environment and central guidance.

b. From the point of view of modernness, the technical level of production and organizational and leadership culture:

--The technical parameters of about half of the products reach the international level;

--Modernization and the necessary further development can be guranteed for the other products remaining in production by means of license purchases, planned cooperation and our own research and development and manufacturing technology development associated with these (suitably prepared experts for this are available partly in the enterprises and partly in the research institutes).

The manufacture of these products requires an especially high level of training. Some of the needed manufacturing experience and documentation is available; what is lacking can be acquired on a continuing basis. The organizational and leadership level of the enterprises can be judged higher than the industrial average; in some places it is being developed now. In the interest of systematic comparisons there should be a significant improvement in obtaining information about the world market, the competition, including the socialist partners.

c. The present and long-range market positions are favorable. Automation is a long-term trend characteristic of the development of a number pf production branches throughout the world. The demand for modern automation is characteristic even of a number of investments--the defining ones--of developing countries. So it can be said with confidence that there will be an increasing demand on the world market, in terms of both volume and ratio, for automated machines and equipment, complete systems and the necessary automation devices.

The marketing of domestic production can be maintained and even expanded further not only because its volume is relatively small on the world scale but also because of the quality of the products and on the basis of our international cooperation contracts. But this will require further effort, especially to increase our ability to deliver complete systems. With such complete systems an opportunity will open for a much more vigorous export than at present to developing countries--partly by means of technology and partly in connection with deliveries by other countries. The price situation for this is favorable--because of the significant, high level intellectual and physical work invested, which requires great expertise.

The narrowing of the selection which has begun in a number of areas, and the expansion of joint deliveries interdependent with this, will probably improve the market positions further. Suitably prepared and implemented technical-scientific cooperation can consolidate the market positions and aid joint deliveries (for example, in the areas of oil and gas automatics, railway reservations, pneumatic and hydraulic automation devices, laboratory and factory measurement automation, etc).

d. An ever increasing proportion of the primary materials and parts needed to manufacture automation devices can be obtained from domestic resources--as a result of metallurgical and other developments decided on and underway--or from socialist import.

The swift scientific-technical development which can be experienced in this area worldwide justifies temporarily the necessity of a relatively greater proportion of productive capitalist import for the manufacture of these products, the negative foreign exchange effect of which can be averted in part by appropriate capitalist production cooperation agreements--long-range and well

thought out--but in the long term--in the event of appropriate agreements--one can count on the reality of replacement by means of socialist imports and domestic manufacture. Such actions can result in an improvement in the terms of trade, but this requires very good information and presumes flexibility.

The expected development of the electronics industry--including the parts industry--will provide a significant background for the manufacture of automation devices also.

e. Among other advantages one must mention the determining role of these products for the development of the national economy and for productivity. It is no exaggeration to say that a deliberate increase in automation is one of the essential conditions for creating our economic balance and for laying the foundations for our further growth. The entire national economy will enjoy the efficiency increasing effect of automation through its applications.

Similarly advantageous are the relatively small materials proportion, the low specific weight of the materials used, by virtue of which there are fewer transportation tasks for the same production value; and the specific energy requirement is lower than the national economic or machine industry average. The manufacture of these products is not energy-demanding.

It is also characteristic of these products that they are less susceptible than the average to variations in the business cycle. It might be mentioned as a further advantage that a large part of the automation devices are exportable and the efficiency of production has good indexes--according to an efficiency study done by the Ministry of Finance by manufacturing branch.

The foreign exchange generation indexes for sales on the capitalist market--although the volume is still low--are more favorable than the machine industry average, and there is a real possibility to increase the volume also.

Taking all this into consideration the manufacture of automation devices within the production structure of the Hungarian machine industry cannot only be maintained but should be developed, as a manufacturing branch suiting the conditions of our economy, one which can be judged positively according to all criteria.

The Present Situation, Long-Range Developmental Trends

During recent years the domestic manufacture of automation devices made significant progress. The number of enterprises or institutions dealing with the manufacture of automation devices or the sale of systems increased and the spectrum of products made available by these enterprises broadened. The developed instrument industry, signal technology, strong current, general machine industry and other industrial branch developmental, design, manufacturing and contracting enterprises carried out the manufacture of automation devices or sale of systems in addition to other tasks--generally not aimed at automation--depending on what needs arose and which activities or products ensured the greater profit from the viewpoint of local (enterprise) interests.

The sale of complete equipment increased primarily. Domestic manufacture of automatics elements did not keep pace with the increasing needs; the great majority of the acquisition of import elements took place on an ad hoc basis due to the shortage of working assets for stockpiling enterprises.

This "branch of industry" developed very dynamically during the Fourth Five-Year Plan. Basically the development was made possible by the fact that there was a very solvent demand in the socialist relationship, and primarily on the part of the Soviet Union. During the Fifth Five-Year Plan a definite selective development was realized in the manufacture of gas and oil industry automation devices. In the interest of satisfying the extra demand of our economy for petroleum products we were able to pay for a significant part of our extra energy imports by delivering these products, energy which otherwise could have been obtained only in the capitalist relationship. The ratio of capitalist parts used for these deliveries was under the machine industry average and in this period it provided a good profit.

We can see the chief balance data in Table 1, which facilitates an order of magnitude overview.

Table 1. Source and Use Data for Automation Devices
In billions of forints, at comparable prices

	In the Fifth Five-Year Plan	In 1980
Production	28	6.4
Import	18	4.6
--socialist	8	2.1
--capitalist	10	2.5
Total sources	46	11.0
Domestic use	31	7.1
Export	15	3.9
--Socialist	13.5	3.5
--capitalist	1.5	0.4
Total use	46	11

The data are the result of expert estimates and serve only to show the orders of magnitude.

Automatics Industry Research and Development

The two chief areas of automatics industry research and development activity provide new scientific and technical information:

--for the manufacture of automation devices (elements, apparatus, equipment, systems, primarily for enterprises belonging to the signal technology, instruments industry, strong current and precision engineering industrial branch) and

--for the application of automation in the most varied branches of the national economy, for the creation of automated machines, equipment, technologies and systems.

Significant automation R and D activity is carried out by the MTA-SZTAKI and KFKI and by the automation sections of a number of industrial research institutes (for example, the VKI, TKI [Telecommunication Research Institute], MIKI, VEIKI, KEKI [Central Research Insitute of the Food Industry], SZIKKTI [Central Research and Planning Institute of the Silicate Industry], and ETI [Institute of Architectu e]). The research and development or license adaptation activity of a number of enterprises manufacturing automation devices (for example, VILATI, the VBKM, MMG-AM and EMG) has expanded significantly.

The economic efficiency of the automation R and D activity of our research institutes was not satisfactory in the past period. Their apparent achievements most often derived from small series manufacture of various devices, which was encouraged in part by the economic regulators or was aided by the inflexibility of our industrial enterprises, our foreign exchange problems at the level of the national economy or by our shortage economy.

In the interest of greater profit, which is demanded and which ensures development, the research institutes also undertake production interdependent with their developments. At the same time only a smaller part of the research institutes carry out product development pertaining to series manufactured elements. In order to undertake larger tasks the factory bases formed their own developmental sections and give primarily only partial tasks to others. The existence of separate institutes working for their own profit also meant that a number of them prepared to do tasks of the same character while there have not been actions to research, develop and initiate manufacture of products thus far obtained from capitalist import which could be replaced by domestic products.

Creating closer guidance on organizational links between research institutes and manufacturing enterprises and the development of economic conditions encouraging swift industrial introduction of achievements would aid a harmonization of the goals of research and development institutes with the needs of the national economy and a swift industrial introduction of their achievements--in this area as well.

We have significant research and development tasks primarily in connection with the domestic manufacture of machines and technological equipment, in the development of complete automated machines, equipment, technologies and automation and guidance technology systems for entire factories.

The needs and the possibilities for economical sales point toward complex deliveries containing a significant ratio of intellectual work, and the further development of our economy also requires increased use of efficient automation, which cannot do without domestic R and D activity, so this should be maintained at a level proportional to our tasks and resources.

In the future in the area of automation research and development we must make especially great efforts to develop socialist integration and capitalist export:

--In the first place, in the area of development and manufacture of automation elements where one can manufacture economically even in small series and where needed for the domestic manufacture of complete automatic systems, we should concentrate our resources on the development of highly reliable elements with special specifications, taking into consideration the related needs for electronic and precision engineering parts;

--In the second place, we must significantly expand our activity in developing complete systems, but it is an indispensable condition for this that there be available in time and in suitable variety the necessary modern parts, elements and devices (electric, pneumatic and hydraulic) from domestic manufacture or socialist import but if necessary from capitalist import as well. The more complicated, larger volume and higher technical tasks of the future may require, in addition to intensive and coordinated systems development, the purchase of licenses and know-how pertaining to systems and, on occasion, international cooperation.

Manufacture of Automatics Elements

Important product centers of gravity have developed in the manufacture of automatics elements, but at the same time the development of certain product groups and beginning or ending manufacture of them is uncoordinated.

In the course of the structural transformation of automatics industry activities the manufacture or import of elements and devices continues to play an important role.

Domestic manufacture of automatics elements can be developed successfully only on the basis of deliberate preparatory work and by taking socialist integration into consideration. By taking into consideration the requirements of automatic systems to be developed and manufactured in the long term we must define those element families which must be made available to the systems manufacturers over the long term either from domestic manufacture or within the framework of integration (via specialization agreements). Even the realization of domestic manufacture may take place via the purchase of licenses for modern, well proven and technologized foreign products and the associated cooperation.

The few examples listed below illustrate the status or changes in the product structure and sum up forecasts pertaining to the long-range development of certain product groups.

A. There has been significant development in the area of products belonging in the strong current product group; among other things, the VBKM solved the development of magnetic switches by purchasing a license. The manufacture of strong current devices and equipment, including strong current automation devices, is rather concentrated in this large enterprise also.

There will continue to be a need for magnetic switches but to some extent devices consisting of high performance electronic elements can be expected to replace electromechanical designs. One can expect a further miniaturization of the control and signalling devices used today and an adaptation to electronic circuits.

B. Danuvia has undertaken manufacture of devices for hydraulic automation (which the ITJ classifies as hydrostatic energy transmission devices) primarily on the basis of a license. This enterprise is the chief developer and "profile patron" of this area.

There will continue to be a need for hydraulic automation devices--primarily for tasks requiring great strength. It can be expected, however, that in such applications there will be a much greater interweaving of electric, pneumatic and hydraulic technology.

C. A number of enterprises and institutes (EVIG, GVM, MTA-SZTAKI, VBKM, VILATI and VKI) and institutions of higher learning (BME [Budapest Technical University] and KKVMF [expansion unknown]) are dealing with the development or manufacture of semiconductor (tyristor) devices for electric control of driving mechanisms. Modern products have been provided as a result of earlier developments but because of the relatively small series and parallel work this is not done most economically. At the initiative of the OMFB and as a result of material incentive the listed enterprises and institutes also carried out coordinated development on the basis of which it may be possible to divide up the manufacturing tasks also. The use of electric driving mechanism controls and high performance electronic devices will increase further--partly because of the need to conserve energy. Over the long term it can be expected that tyristor control equipment will be used to a large extent for alternating current driving mechanisms also while microprocessors will play an increasing role in information processing units.

D. The Precision Mountings Factory has purchased a license for pneumatic machine control devices and it carries out successful development and manufacture. It performs coordination for the entire area because it is the most important domestic enterprise in this area. The MMG-AM also manufactures pneumatic machine control devices, in coordination with the Precision Mountings Factory.

There will continue to be a need for pneumatic machine control devices. But what was said in point B also applies to these.

E. Because of a shortage of capacity the former "profile patron" and single domestic manufacturer, the MMG-AM, has greatly reduced the development and manufacture of analog process control organs working with auxiliary pneumatic energy. Basically it manufactures such devices only for use in its own systems. The volume of capitalist import in this product group has increased because the necessary elements can be obtained from the socialist relationship only with long-time limits.

The importance of pneumatic analog automatics elements can be expected to decrease further and over the long run the use of this technology will be limited primarily to operation of intervention organs.

F. A number of enterprises deal with manufacture of electric analog elements; GAMMA manufactures its system on the basis of its own development. The MMG-AM manufactures remote transmitters on the basis of a license. The GANZ Instrument Works also deals with manufacture of this element group--but does not have a complete variety. The development of basic types is not coordinated. In the interest of product modernization and development of an optimal variety it is necessary to unite and coordinate development and manufacture.

One can forecast the use of electric analog automatics elements for a long time yet but with the spread of microelectronic devices there will be increased use of digital control.

There must be an attempt to satisfy needs better, by an appropriate development of domestic elements manufacture, improving stockpiling and developing appropriate capitalist cooperation and export, which will also improve the capitalist balance of payments. But in the interest of more efficient production coordination and cooperation links among enterprises must definitely be strengthened.

In this theme the conception recommends that:

In order to develop the manufacture of automatics elements and devices and ensure the conditions for economical manufacture we should put together and continually actualize an automatics element specialization work plan--with the participation of the interested enterprises, chief authorities and organizations--taking into consideration the systems specialization proposals and making use of the experiences of URS specialization work and adapting it to the domestic technological development program.

The elements manufacturers and those delivering systems should harmonize the work plan on the basis of both technical and economic viewpoints--bringing in users and foreign trade--and then taking this into consideration the enterprises conducting automatics industry activity should begin to realize a well-founded, vigorous, accelerated specialization program. Taking into consideration cooperation agreements and socialist integration and in harmony with these there should be, on the one hand, a deliberate development of domestic automatics element manufacture and, on the other hand, support for socialist import via long-term agreements.

Marketing Automation Devices

From the point of view of trade the instruments and automation devices can be broken down into two groups (to which we can thirdly add spare part type products)

a. Operational instruments and automation devices and their parts of a mass character which are typically classified as off the shelf goods. These are

manufactured in a production line way once or twice a year although the users have constant need of them. The TEK [enterprises trading in tools of production] enterprises (MIGERT [Instrument and Office Machine Marketing Enterprise] and VILLERT [Marketing Enterprise for Electrical Items and Equipment]) do not have sufficient assets to maintain buffer warehouses of sufficient size. If domestic manufacture fails for any reason these instruments must be provided from imports but the throughput time for this from socialist import is at least 1 year--if they even manufacture and are willing to deliver the instruments we need. There is a need to expand working assets here--possibly from central resources.

b. More complicated automatics, the acquisition of which is possible only on the basis of prior calibration and planning. The typical representatives of this group are units working with auxiliary pneumatic and electric energy, which are needed in relatively few types but in very many versions.

If delivery of these from domestic or other socialist sources is deferred for any reason the same item cannot be obtained from other import so re-design becomes necessary. The difficulties are increased by the fact that if any such unit breaks down it can be replaced only with the same type, without considerable modifications. In the interest of increasing flexibility it should be made possible for the manufacturers to maintain larger stockpiles of subassemblies so that assembly can be done in a short time after the appearance of a need.

c. The TEK enterprises provide the parts needed for the products listed above--since there is no enterprise providing service. ELEKTROMODUL trades in the electronic and electromechanical parts manufactured in series.

The several stockpiling enterprises trade in the various products in different groupings. But it is characteristic of all of them (with the possible exception of ELEKTROMODUL) that they do not conduct wholesale trade but only act as intermediaries.

The products of ELEKTROMODUL are parts and subassemblies from which the most varied finished products can be assembled.

The instruments and automation devices traded by MIGERT are finished products appearing in great variety. One of the characteristic profiles of MIGERT is trade in and stockpiling of office machines also, which involves fewer types and less worry and results in greater profit for the enterprise, and which has virtually nothing in common with trade in automation devices.

VILLERT and the Tool and Small Machine Marketing Enterprise also stockpile automatics elements and devices (of a strong current or machine industry character).

Trade in automatics elements selected for domestic manufacture and provided insofar as possible on the basis of specialization agreements should be made the task of a stockpiling enterprise dealing with automation--and selected for this purpose--as its chief profile or basically oriented in this direction in terms of interests and assets. But this task must be carried out

at a much better technical and economic level than at present. In the interest of satisfying demands which keep pace with technical development it must receive material possibilities for filing in time the previously planned allotments for socialist import (even before the final, detailed specification of domestic requirements). It would be useful for the stockpiling enterprise to sign long-term contracts which will ensure that within the annual allotments the final specifications need be submitted only a few months before delivery.

This method can ensure that an element variety from the same source can be used for similar tasks so that it will not be necessary to change already proven technical solutions. (Foreign customers of automatic equipment consider this problem to be very serious and in many cases they specify that the same elements be used for new deliveries.)

There is need for an organization carrying out intermediate wholesale trade activity which will be capable of surveying automation device needs and selecting sources to satisfy them which will be advantageous even at the level of the national economy, on the basis of its own possibilities or the available supply. There is also need for close cooperation between the stockpiling enterprise and the foreign trade enterprise specializing in foreign trade in automation devices, which will make possible coordination of export and import as well.

It would be useful to have two types of system trading simultaneously in automatics elements and devices:

--in the area of mass automatics elements and operational instruments it is necessary to bring in the TEK enterprises and step up their activity;

--in the area of more complex automation devices with unique specifications it is necessary to have direct contact between manufacturer and user, with the inclusion of foreign trade in the case of import acquisition.

In addition it is necessary

--to better harmonize the market activity of organizationally separate units (industry, trade in tools of production, foreign trade) and create common technical foundations (standardization, reducing variety, etc) with the aid of the supervising ministries.

The conception recommends that:

--a work plan to increase capitalist export, to guarantee in a suitable way the supply of automation devices which can be acquired at present only from capitalist import and to improve the capitalist foreign exchange balance must be worked out and continually actualized in harmony with element specialization tasks and tasks pertaining to the long-range development of automatic systems,

--the Ministry of Foreign Trade should review its regulations regulating export and import trade in automatics elements and equipment and should

examine the conditions for the functioning of a foreign trade enterprise which will be capable of efficiently carrying out--not in a monopoly position--tasks of foreign trade in automation devices.

In the interest of a harmonization of export and import it would seem useful to entrust the bulk of foreign trade in automation devices to an enterprise which would have close contact with domestic manufacturers and the stockpiling enterprise carrying out the bulk of the trade, one which would be responsible--together with the interested stockpiling enterprise and manufacturing enterprises--for specialization in automation devices.

--The National Materials and Price Office and the Ministry of Industry should examine the conditions for the functioning of a TEK enterprise which would be capable--not in a monopoly position--of efficiently performing the tasks of wholesale trade in automation devices and which would have the working funds needed for this. It should have close contact with the appropriate foreign trade enterprise in order to obtain the elements and devices to be stockpiled and it should be responsible--together with the foreign trade enterprise or manufacturers--for specialization in automatics elements. It should organize the stockpiling at domestic manufacturing enterprises of those subassemblies from which equipment could be completely assembled in a short time--and should be able to finance this stockpiling if necessary--so that short delivery times can be guaranteed.

Designing, Manufacturing and Contracting for Automatic Equipment and Systems

A number of enterprises in our homeland which conduct automatics industry activity also deal with the task-oriented development, design and execution of automatic systems. For example: the MMG-AM is the designated chief contractor for gas and oil pipeline automatics; the chief partner of the OVH [National Water Bureau] in hydrological automatic systems is GAMMA. VILATI and the EMG develop and manufacture NC and CNC machine tool controls. The VBKM is the chief source of light and other information display equipment. Manufacture of railway safety equipment is the task of the GVM. It is primarily VILATI that deals with development, design and execution of highway traffic control equipment. In addition to the MMG-AM a number of other enterprises or institutes (for example, MIKI, VEIKI, VBKM, VILATI, Faculties of the BME, etc) develop, design and executive telemechanical systems.

These examples show the growth in the interest in delivering complete systems.

During the past 20 years a number of significant system design and prime contractor bases developed within the framework of the Ministry of Metallurgy and the Machine Industry (MMG-AM, VBKM, VILATI) which have their own equipment manufacture and even element manufacture. Automation sections working in technological planning institutes outside the machine industry developed also (for example, OLAJTERV, VEGYTERV, BANYATERV, EROTERV, EGI, KIPTERV, etc).

Table 2, published for purposes of information, contains those complete automatic systems with which Hungarian automation device manufacturing enterprises have dealt thus far to a lesser or greater degree on the basis of domestic and export demand. It is useful to select from these those which it would be useful

Table 2.

	Danuvia	EMG	EVIG	Precision Mountings Factory	Gamma	GANZ Instruments	GANZ Electric	Laboratory NIM	MMG-AM	METRIPOND	VBKM	VILATI	Other state industry	Cooperatives	Notes	Nature of Task
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Extracting industry													1			
1.1 Gas and oil pipeline automatic systems									+				0		F	N
2. Electric power production																
2.1 Control subsystems for nuclear power plants			+		+								2+			R
2.2 Power plant water management systems					+							0			F	R
2.3 Power plant and central boiler automatic equipment						0			0			0	2+			R
2.4 Control equipment for power plant machines							+									R
2.5 Energy management measurement and control systems						+			+		0	0				R
2.6 Electric power industry telemechanical systems									+		0				F	J
3. Ferrous and nonferrous metallurgy																
3.1 Automatic equipment for pipe factories and rolling works							0				+	+			F	E
3.2 Automatic equipment for metallurgical furnaces													3+		F	E
4. Chemical industry and petrochemical industry																
4.1 Automatic equipment for lacquer, paint and enamel manufacture												+			F	J
4.2 Automatic equipment for rubber and plastic industry machines			0								0	+			F	E
5. Machine manufacturing industry													8			
5.1 Automatic equipment for materials movement											+		0		F	R
5.2 Machine industry manufacture control												+			F	E
5.3 Hydraulic controls	+														F	R
5.4 Pneumatic controls				+					0						F	R
5.5 Equipment to control electric driving mechanisms			+				+				+	+			F	J
5.6 NC controls for machine tools, forging and pressing machines		+										+			F	J
5.7 Electronic measuring automats and testing equipment		+											4		F	R
5.8 Machine industry manufacture testing equipment												+	0		F	E
6. Construction materials industry																
6.1 Automatic equipment for furnaces and plants					+						+				F	R
6.2 Automatic equipment to measure and handle solid materials										+	0	0			F	R
7. Construction industry													1			
7.1 Automatic equipment for prestressed concrete element factories													0			E
8. Paper and woodworking industry																
9. Agriculture																
9.1 Automatic equipment for animal husbandry sites			+								+				F	J
9.2 Automatic equipment for feed manufacture												+			F	J
9.3 Automatic equipment for slaughter houses and meat processing machines													5+	0	F	J

[table continued]

Table 2 [continued]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
10. Foodstuffs industry																
10.1 Automatic equipment for fruit and vegetable canning factories											+	+		0	F	J
10.2 Automatic equipment for cold-storage plants and coolers													6+	0		R
10.3 Automatic equipment for mills, bread factories and cheese factories											+	+		0	F	J
11. Transportation																
11.1 Highway traffic control												+			F	J
11.2 Railway automatic controls							+								F	R
11.3 Transportation reservation system												+				R
12. City management and environmental protection																
12.1 Equipment to measure pollution								+	+					+	F	J
12.2 Hydrological automatic equipment					+				0		0	0			F	J
12.3 Automatic equipment for biological sewage purification					+				0		0				F	J
12.4 Automatic equipment for industrial sewage purification									+						F	J
12.5 Gas danger and fire alarm systems									+						F	E
12.6 Automatic equipment for dust separators									0			+			F	R
12.7 Communal heating and air-conditioning control						+			+			0		0		R
13. Light industry																
14. Other																
14.1 Light and other information display equipment											+			+	F	E
14.2 Automatic laboratory equipment								+						+	F	E
14.3 Automatic medical technology equipment													7+		F	E
14.4 Automatic telephone exchanges													9+		F	E

Explanations for Table 2

+ Developing and manufacturing enterprises capable of carrying out complex tasks in the themes (or larger independent part-areas therein) or enterprises conducting development-manufacturing-system design-prime contracting activity (specialized or base enterprises).

0 Enterprises cooperating in the given theme with specialized or base enterprises (those marked with a +) or enterprises with considerable capacity in the theme (on the basis of the results of developments thus far it would be useful to extend cooperation to these enterprises).

F In the "Notes" column this means that the designated enterprises are suitable for carrying out complex tasks in the several themes (or larger independent part-areas therein) in the form of prime contracting (or coordination contracting).

Designations used in the "Nature of Task" column:

N Tasks (systems) of national economic significance
J Significant automatic systems
E Ad hoc (compound) automation tasks
R Delivery of part-systems can be expected in the theme

Numbers used in the "Other state industry" column:

1. VEGYEPSZER
2. Hungarian Electric Works Trust
3. Metallurgical Factory Construction Enterprise
4. VIDEOTON
5. MEZOGEP Trust
6. VERTESZ
7. Motorcor Works
8. INTRANSZMAS, HAFE
9. BHG

to further develop and manufacture, taking into consideration the achievements thus far or as a function of the results of CEMA integration discussions. The table shows the machine industry enterprises dealing with this theme, indicating separately the enterprises and cooperating facilities suitable for inclusion. These enterprises already know the pertinent technologies or automation requirements and thus have the requisite expertise and experience to carry out future, similar tasks.

The compilation also contains the export interests of the domestic machine industry. The Hungarian machine industry offers these products on the capitalist market and in CEMA as technologies which can be delivered by the Hungarian People's Republic. The most modern current automatic systems must be ensured for the technologies listed.

In addition to the machine industry enterprises appearing in the table system design and contracting enterprises working in the user branches also work to satisfy user (investor) needs. In general the table does not contain these enterprises but their products may appear on occasion as independent production. (Column 13 of the table mentions a few enterprises because the production of these is considerable.)

Expert automatic system designers and manufacturers or systems contractors working closely with them are needed to carry out large volume, complex automation tasks.

In the case of complex technologies it would be advantageous if the technologist and the designer of the automatic system worked within the framework of a single enterprise--a technological design enterprise. At other times a vertical linkage of those engaged in automation is useful. In the interest of increasing developmental and contracting responsibility in connection with the delivery of systems it may become necessary to permanently or temporarily regroup certain organizational units, sections or experts so that a significant part of those dealing with some theme can be put into a coherent organizational unit--of a design satisfactory and necessary for the carrying out of the task--or into a team or association put together for the given task. Both the organizations and the individuals must be made interested in doing this.

The conditions for automatics undertakings (specialized prime contracting or coordination undertakings) must be assured on the basis of resolutions extending the prime contracting system, but taking into consideration the special conditions. In this way the enterprises conducting automatics industry activity can be linked efficiently into the execution of government level efforts pertaining to an acceleration of investments. The organizations capable of undertakings in automation (at present these would include the MMG-AM, VBKM, GAMMA and VILATI) must be developed further in a manner similar to those organizations suitable for technological prime contracting. Developing these organizations into prime contractors fully satisfying all conditions is a very slow process (within the framework of the economic regulators). The delivery of systems judged to have prospects should be entrusted to "system patrons" who are capable of carrying out a significant part of the work connected with the given systems within the framework of their own activity.

There must be an effort to export complete automatic systems, with installation or leadership of the installation and other services all the way to putting them into operation; this is also an ever increasing market requirement. Such complete systems include automatic equipment for oil pumping stations and tank parks, control systems for city and natural gas networks, complex data collecting and control systems for oil fields, various machine industry and metallurgical automatic equipment and automated measurement systems.

The conception recommends that:

--We must work out and continually actualize specialization ideas for internal use--as an initial Hungarian position to be taken in CEMA forums and in bilateral discussions--in regard to the most important automated control systems to be manufactured domestically in the future and types of systems to be specialized in by other countries.

The proposals must be worked out taking into consideration the selective industrial development goals of the national economy and the machine industry, in close cooperation with the domestic enterprises manufacturing technological equipment and machines, in parallel with analysis and survey work being done within CEMA and adjusted to the user nomenclature adopted there, primarily for systems needed for domestic technologies but also for technologies of foreign manufacture and for systems which can be marketed independently. In addition a proposal must be prepared in regard to the most important automation devices and equipment which can be delivered to potential foreign manufacturing partners and for those to be imported. This work must lay the foundations for integration cooperation in this area. It must take into consideration those factors which can ensure capitalist export of automated control systems (joint deliveries with capitalist firms selling technology, etc).

--Starting from the fact that a suitable background is absolutely necessary for the marketing of modern automatic systems the Ministry of Industry, which exercises professional supervision over the finishing enterprises, should support the development of a technological development program and its continual actualization in the interest of the development of element manufacture and equipment manufacture technologies, analyzing the possibilities and conditions for the intensive technological development necessary for this.

Licenses and know-how must be purchased taking this into consideration.

Manufacturing technology must be developed in harmony with the purchase of the intellectual achievements serving product development.

--The finishing enterprises conducting automatics industry activity which are carrying out stressed tasks should have the possibility--on the basis of well-supported requests and within the frameworks of current credit policy guiding principles--of assuming investment credits for the development of manufacturing or special automatics assembly technology and of assuming the necessary working asset credits.

--In the interest of developing CEMA specialization and the domestic division of labor it would be useful to work out plan goals for the technical

development of automatic systems and equipment judged to have prospects, which should include an examination of the economic conditions for technical development.

--In the interest of carrying out those automation tasks judged to have prospects the interested ministries and chief authorities should examine the possibilities and conditions for closer cooperation (based on contract or organizational links) among their enterprises conducting such activities and the independent research and development and planning institutions.

--"The organizational, financial and economic problems of setting up the prime contracting needed to deliver complete systems must be solved."

From time to time it would be useful to review the development achieved in this area by decrees aimed at aiding investment and export prime contracting activity. In this connection one must analyze the extent to which these decrees solved the problems and what further measures may be necessary in the interest of improving this activity.

Assembling Automatic Systems

In the realization of manufacturing technology facilities of industrial plants the planning, manufacture and construction are followed by technological assembly and the beginning of operations to make the facility operational.

By technological assembly we mean the assembly and installation on the site of the machines and equipment and structures in general necessary for the development, supply and control of the technological processes of industrial installations, plants and machine systems.

The on the site assembly of automatic systems also belongs to the concept of technological assembly and the assembly enterprises do this work in accordance with the regulations pertaining to technological assembly.

A study prepared by the Ministry of Metallurgy and the Machine Industry titled "Satisfaction of the Qualitative and Quantitative Requirements Posed for Technological Assembly" examined the state of and developmental conditions for domestic technological assembly operations.

The assembly of instruments and automatic devices makes up about 8 percent of the total in value and about 5 percent of the total in personnel. Those dealing with assembly of instruments and automatic equipment are primarily the BKG, CSOSZER, KIPSZER, MMG-AM, VBKM, VEGYEPSZER, VILATI and VIV. Automatics assembly represents only a relatively small proportion of the total activity of all these enterprises and it satisfies the demand only in part (some investments are realized after delays and at the price of many difficulties).

The realization of automatic systems, including assembly and related supplementary activities, now takes place along two parallel lines:

--the manufacturing prime contractor does the work, and
--a user side assembly enterprise finishes it up (VEGYEPSZER, VERTESZ, BKG, etc).

Since the manufacturing enterprises have only small assembly sections by far the greater proportion of domestic automatic systems are finished by user side enterprises and only a smaller proportion (about 20 percent) as work of enterprises belonging to the machine industry. In many cases the machine industry enterprises make use of the work of user side assembly enterprises--for their own prime contracting jobs. And this creates a bottleneck.

The user side assembly enterprises should concentrate primarily on assembly of automatic systems obtainable from import and on the related supplementary activities.

On site assembly activity takes place with obsolete or deficient tools and materials. Due to the lack of special tools and materials the assembly enterprises must make them.

The inadequate number of specially trained workers available for automatics assembly represents a great problem in general. Bad working conditions, restrictions on wages, commission fees, etc. make it difficult to solve the problem. At the same time, considering the many types of automatics assembly sections working in the country in small groups, it is very difficult to conduct the necessary training and further training.

Another important problem is the unsatisfactory nature of the technological level of and equipment for assembly. But technological development investments can improve the level only if appropriate emphasis is given to preparing people to use the tools.

The conception recommends that:

"We must expand the capacity available for the assembly of automatic systems and improve the technological level of and equipment for assembly."

The progress achieved in this area as a result of the resolution of the State Planning Committee pertaining to the development of technological assembly operations should be reviewed from time to time and, if necessary, recommendations for further measures should be made.

Customer Service and Servicing

A professional solution for customer services and servicing is an important condition for the spread of modern automatic equipment. A quick and precise satisfaction of such needs is a natural interest of those selling systems because:

--good references for the system can ensure the acquisition of markets or the expansion of market contacts; and

--feedback, discovering and reporting technical problems with automatic systems delivered, increases the possibility of improving the work of making systems available.

Today this very important activity struggles with many difficulties, primarily for economic reasons, and for this reason customer services, servicing and the supply of spare parts for automatic systems placed in operation are not satisfactory. This has a harmful influence on the efficiency of automated production equipment and thus on a greater spread of automation. Some large users who have the necessary material assets are prepared to maintain the systems. But the smaller users, who have limited material assets and manpower capacity, cannot build up a maintenance base. When assembled equipment of great value breaks down such enterprises are sometimes forced to put it out of operation for relatively long times, in the absence of a suitable maintenance organization.

Domestic enterprises conducting automatics industry activity in general do not operate a service network, or do so with inadequate efficiency. The supply of tools (trucks, instruments, special tools), the lack of experts and the financing of stockpiles of spare parts represent a problem for them (the investment funds or working funds). Thus, in many cases, the interested producing enterprises do not even try to organize service. This deficiency absolutely must be overcome. This will require a very profound costs and other analysis and the results of this must be compared with an analysis of competing foreign enterprises.

Some foreign enterprises have set up a brand name service. Unfortunately only a few of the enterprises of socialist countries manufacturing automation devices (for example, the GRW) have a brand name service; such a thing can be created only in the case of larger volume, regular deliveries.

Domestic Cooperation and Organization Links

Both domestic and export automation needs or delivery possibilities are appearing as ever more complex tasks with large volume and short throughput times. The possibilities of our present enterprise organization, consisting of independent and competing units, their intellectual and manufacturing capacity and their financial assets are not satisfactory, separately, for meeting these needs. So it is necessary to take steps as a result of which the enterprises delivering automation systems will become capable of carrying out the broad scale of tasks to satisfy the needs and thus carrying out the following functions with appropriate incentive:

a. For large volume, complex automation tasks:

--operating an automation consulting service,

--developing contracting bids,

--carrying out tasks with results guaranteed in a contract,

--sharing the task with cooperating domestic and foreign enterprises and joining together for fulfillment,

--ensuring the necessary supplementary assets to carry out complex tasks,

--setting up a central customer service, training and maintenance organization and maintaining stockpiles of replacement parts (for the equipment delivered by them),

--ensuring contact with enterprises in the user sphere which also deal with automation planning;

b. To coordinate the work of enterprises participating in cooperation:

--working out recommendations for technical and economic development,

--eliminating superfluous duplication,

--organizing and guiding cooperation,

--rational sharing of the manufacture of automation devices,

--coordinating international cooperation,

--developing a coordinated export and import policy,

--standardization work pertaining to automation devices,

--swift acquisition of products from outside sources which are frequently used by the cooperating enterprises.

One cannot expect these functions to be carried out in the present, isolated task and legal structure of our enterprises and associations nor is there an economic environment encouraging cooperation such that the responsible enterprises would unite in the interest of some larger deal. So, in order to carry out the tasks listed, it would be useful for the ministry exercising the rights of proprietor to propose, with appropriate foresight, to the State Planning Committee the creation of organizations or flexible cooperation contacts with the capital and intellectual concentration to conduct complex automatics industry activities of larger volume which are important from the viewpoint of the national economy. These measures might also ensure that we might undertake larger tasks more quickly, including export in the non-ruble account.

Background Industry

The manufacture of automatics elements requires modern methods, in many cases mass manufacture. Mass manufacture can be efficient only if it is done at a level which makes possible exploitation of the economic advantages deriving from the mass character thereof. Working machines with the most modern controls can be used in small series manufacture.

The optimal criteria for the manufacture of automatics elements require that:

--the manufacture of small numbers of technologically concentrated parts be at the same level as the main manufacturing process, and that

--basic, auxiliary and cooperation materials of uniform quality flow into the process at the required rate, with a certain minimal level of stockpiling.

Satisfying both conditions depends fundamentally on the performance of the cooperating enterprises, on the organization of the so-called "background industry," on its manufacturing, quality level and cooperation discipline.

Because of the interest relationships being realized in our economy neither the manufacture of automatics elements nor the activities of other subbranches can adequately influence or suitably organize the supply of articles manufactured in the background industry.

This situation is made worse by the fact that in the course of the reconstruction carried out in the preceding plan period in the manufacture of automatics elements and in other mass manufacturing subbranches modern manufacturing systems came into being, largely from capitalist imports, the rational operation of which requires a large volume of suitable quality metal, plastic, etc, parts which are provided by the background industry. The failure to satisfy these needs causes increasing import (primarily in the case of licensed manufacture); stockpile problems and delivery delays are arising; and in the final analysis this puts a limit on the efficiency of the subbranch which is not justified by the technical preparedness and possibilities of the subbranch.

Thus it would be useful to bring in the Ministry of Industry to prepare a proposal which would prescribe significant changes in the structure of the background industry in the interest of having the manufacturing branches which depend upon it be able to exploit adequately the advantages offered by this production.

Expert Needs

The structural change taking place in the areas of the manufacture of automation devices and delivery of systems influences the size and qualitative composition of the expert needs of automatics industry activity. Quantitative satisfaction of the expert needs can be guaranteed but satisfaction of the qualitative needs will require at all levels of expert training (in the universities and colleges, in skilled worker training, in basic training, maintenance training and further training) the teaching of professional information which keeps up with technical development, the use of efficient teaching methods and providing suitable opportunities for systematic further training.

Summary Findings and Conclusions

The conception discusses the domestic resource side questions of automation (research and development, manufacture of automatics elements and systems, trade in automation devices, customer services, the design, delivery and assembly of automatic systems, maintenance and repair, cooperation deals, etc). It contains proposals for the coordinated development of these activities.

The more important findings of the conception are:

An increase in the demand for automation devices can be expected. The users will demand primarily not individual automation devices but rather the delivery of automated machines, equipment, technologies and complete automated systems satisfying definite technological and other applications requirements.

Devices for automation can be produced with a lower materials content but with a substantially higher intellectual expenditure than the machine industry average. Their manufacture is not energy demanding.

Our manufacture of automation devices can considerably improve our foreign exchange balance:

--primarily by replacing capitalist import with domestic deliveries,

--by direct capitalist export (via Hungarian machine manufacturing enterprises), and

--by building up advantageous capitalist cooperation, and thus by direct capitalist export.

In order to develop a more efficient machine industry production structure we should not only maintain our "automatics industry" but also develop it with a dynamic greater than the machine industry average. There is need for circumspect, coordinated selection in the manufacture of both automatics elements and complete automatic equipment. Our enterprises can undertake to satisfy only a part of the multiplicity of needs. The complete variety of the very many types of automatics elements and equipment cannot be manufactured economically in our factories.

Estimating the expected domestic and export needs--in harmony with our possibilities--the following can be designated as developmental and manufacturing centers of gravity for our automatics industry:

--the automatic equipment and control systems for machines, technological equipment and complete factories of domestic manufacture;

--automatic equipment and systems which can be sold independently;

--automation equipment and systems which can be delivered in larger volume within the framework of cooperation for technological and other equipment produced in other countries;

--production of the more important, definitive automatics elements and devices for equipment and systems manufactured or to be manufactured in our homeland; and

--production of automatics elements and devices which can be manufactured economically in large volume.

Our foreign trade must provide the automation devices not manufactured here, primarily from socialist sources; thus it is important to develop in a planned

way specialization and cooperation between the responsible Hungarian enterprises and the automatics industries of CEMA countries.

The indispensable automation devices which cannot be acquired from the socialist market must continue to be ensured from capitalist import; it would be useful to balance out the foreign exchange burdens by means of mutually advantageous cooperation contacts built up with appropriate partners.

The assembly of imported equipment, the installation of subassemblies, maintenance, etc is basically the task of domestic enterprises.

It is necessary for the socialist state leadership--including the Ministry of Industry which exercises professional supervision--to influence the selective development of automatics industry activities in a deliberate, planned way. Spontaneous development will not ensure the effective satisfaction of needs in this sphere of activity which is spreading and developing quickly throughout the world.

This conception was the basis for the program proposal of the national medium range research and development plan (OKKFT) dealing with research and development for automation devices and systems, which will be executed as a ministry program.

8984
CSO: 2502/48

LASER, HOLOGRAPHY SYSTEM TO MEASURE LOADING DEFORMATION

Budapest MUSZAKI ELET in Hungarian 4 Mar 82 p 4

[Excerpts] The past 10 years have produced substantial change in the ways in which lasers are used. Commissioned by the National Technical Development Committee, the Csepel Machine Tool Factory [Csepel Szerszamgep Ipari Muvek] and the Machine Tool Industry Works [Szerszamgepipari Muvek], the department of physics of the Physics Institute of Budapest Polytechnical University has been conducting research on industrial uses of holography. The result is a new type of equipment. Researchers from the department and factory specialists have developed a system which makes possible measurement of deformation resulting from static and dynamic loading of machine tools and parts. The system is based on holographic interferometry. A laser of extremely high coherence is used.

The equipment consists of three parts: a portable, mobile interferometer which makes an interferogram of the areas being inspected, a picture-processing unit which reads the information from the interferogram and converts it into a format suitable for machine input and the data processing unit which determines and displays the elements of dislocation on the basis of a computer program.

So far, the system has been used to conduct static and dynamic load tests on radial drills at Csepel and on lathes at the Machine Tools Industry Works. Researchers intend to improve the system so that a specialist in optics will no longer be essential to operate it.

CSO: 2502/60

BRIEFS

BUBBLE MEMORIES--Research and development on magnetic bubble memories which are made through use of microelectronic technology began in good time at the Central Physics Research Institute. By the mid-seventies the Institute's research results on the properties of the garnet base and the physics of bubble domains were noteworthy even by international standards. Despite this, the first domestic prototypes were not ready till 1980 because of the shortcomings of the microelectronic industrial background. This represents a delay insofar as the international vanguard is concerned. Organization of industrial-style production will probably increase the lag. In the meantime a second generation produced by ion-implantation techniques have become the object of research and development. Thus Hungary should be prepared to pursue this path along with development of more traditional bubble memories which have a permalloy structure. [Budapest MUSZAKI ELET in Hungarian 4 Mar 82 p 4]

COSMIC GEODETIC OBSERVATORY--The Cosmic Geodetic Observatory of the Geodetic Institute [Foldmeresi Intezet Kozmikus Geodeziai Obzervatorium] is located in the valley of Penc in the Cserhat Range of northern Hungary. The observatory with its 25 employees is under the direction of astronomer Ivan Almar, Doctor of Physics. The observatory uses the achievements of space navigation for geodetic and surveying tasks. On the basis of data obtained from tracking satellites, it becomes possible to pinpoint the location of places on earth with extreme accuracy. Such findings are used to prepare maps used in highway planning and waterway management. The observatory contains a number of installations for tracking satellites. One of its assignments is to predict the transit of satellites. The movements of satellites are affected by many factors such as changes in the density of the upper atmosphere. Terrestial magnetic storms make the upper atmosphere denser and reduce the velocity of satellites. New methods require increasingly precise forecasts, and these are possible only with computer programs written in a manner which takes the peculiarities of satellite movement into account. Such programs serve to evaluate observations made on the basis of the Doppler effect. Measurement of shifts in radio frequencies resulting from the Doppler effect of satellites also make exceptionally accurate determination of position possible. There is great worldwide interest in our programs for evaluating these measurements. Our specialists have developed a new instrument for balloon triangulation. Determination of the points to be fixed is facilitated by light signals emitted at regular intervals by sounds from an altitude of 30-35 kilometers against a celestial background. Although the balloons eventually burst and drop their payload, the instrument package is so sturdy that it survives the impact undamaged. [Budapest MAGYAR HIRLAP in Hungarian 17 Mar 82 p 5]

INDUSTRIAL R&D INVESTMENT AND WORK FORCE SURVEY

Belgrade EKONOMSKA POLITIKA in Serbo-Croatian 15 Feb 82 pp 17-19

[Text] Meetings have become commonplace in which stress is put on the need for the domestic scientific research potential to be more fully involved in the economy's technological development. This has also been stressed by the draft of a social compact on the strategy of technological development, which incidentally is a document accompanying the social plan of development for the 5-year period we have just entered; after 2 years of fundamental substantive discussion it has entered the phase of agreement on specifics. Any possible answer concerning its possible contribution is preceded by the question of what the scientific and R&D sector shaped in past decades looks like.

According to the most recent statistics, in 1980 we had about 23,000 researchers in institutes, in units of "nonscientific" OUR's [organization of associated labor] and in university research organizations and units. Aside from researchers organizations and units statistically classified as "scientific research" or "R&D" had approximately 35,000 other employees at various levels of specialized training. It should be mentioned that the statistics have recorded organizations and organizational units which have earned their income through research work, so that the number of researchers did not include all university instructors and staff members, nor people with scientific titles working in production organizations or administrative agencies and other work communities.

The organizations and units which were recorded (totaling 825) realized about 13.3 billion dinars of income from research work the year before last, and this is counted as investment in R&D. Nonuniversity organizations and units earned about 10.7 billion of that total, but at the same time they earned another 5.3 billion dinars of miscellaneous income.

Science in Crumbs

The average of 11 researchers per 10,000 inhabitants and the investment of about 1 percent of the social product in R&D place us on a statistical basis considerably closer to the industrially advanced world than to the developing countries. Especially when we look at the number of researchers. In a study recently done by the Institute for Social Research of Zagreb University for the Federation of Republic and Provincial Scientific Communities, covering the

foundations for development of scientific activity up to 1985, the datum is given that our country possesses 0.9 percent of the world's researchers, that 0.5 percent of total world investments are appropriated to their activity, and they create 0.2-0.3 percent of new world knowledge. The effects of the products of scientific research on the economy's productivity and technological capability cannot, of course, even be calculated in such a way, but it is beyond all doubt that in practice they have remained below expectations.

Nor is it necessary to offer specific proof--and there are no competent analyses in this regard--that foreign knowledge, which has arrived through imported equipment, purchased technologies or licenses on particular products or processes, has been built into the major portion of domestic production. The dominant orientation toward satisfying domestic demand has also had the result that much attention did not even have to be paid to mastering and improving the knowledge purchased, nor have producers had to make particular efforts to bring the expensive equipment and up-to-date technologies into relations to economic benefits that the market could support.

The more offensive export orientation, which has become indispensable because of payments-balance problems if for no other reason, has to be based on faster technological development, especially in the context of the manifest shortage of energy and raw materials. At the same time the evident technological dependence on foreign countries imposes the question of how much we can rely on our own R&D potential and technological development and, still more important, in raising economic efficiency on that basis. The picture offered by an examination of that potential does not provide much basis for optimism.

First of all, one is struck by the fragmentary nature of research and of the resources invested for that purpose. The work of one researcher and funds running between 600,000 and 700,000 dinars are committed annually to carrying out the average project. It is not difficult to see that the researcher's personal income alone represents a good third of the project's cost. Yet that same income is also burdened with the personal incomes of other personnel in scientific research organizations, and then by legal obligations met from income, "overhead" expenses and all the rest. This drastically reduces the material basis for scientific research work.

For years now there have been evident efforts to restrict the front of research projects to larger-scale assignments whose results might provide a sounder basis for development and improvement of production. The outcome of such efforts is to be seen in the selection of several hundred projects of priority importance in the republics or provinces. The funds for some 15 "strategic" projects whose financing, in accordance with an agreement that goes back 3 years, is to be provided by interrepublic and provincial pooling, are being furnished much more slowly than was anticipated.

The necessity of concentration is obvious if we take into account the total financial potential. Only the richest countries can afford a broad front of research. Smaller countries which have a high level of industrial development, possessing considerably greater financial strength than we do, concentrate their research efforts in a few sectors following a drastic selection,

as a rule those sectors in which they wish to take leading positions on the market. The selection of priority research projects running into the hundreds, then, cannot be seen as sufficient concentration, especially in the light of the fact that joint investments in all those projects do not represent even one-tenth of total investments in scientific research in our country.

Total investments in 1980, converted at the rate of exchange of the dinar in effect at that time, do not amount to even $500 million. There are in the world quite a few industrial companies which invested more that year in R&D than $500 million on an individual basis and moreover did so with a clearly defined purpose of arriving at new discoveries, technologies and products.

The Effect of Restrictions

The funds being invested through communities for science and obtained through the mechanisms of "free exchange of labor" have a share of 14 percent in total investments in scientific research. The principal purpose of these funds, which are collected through a mandatory contribution, aside from financing programs which are socially significant, though the results cannot be applied to development purposes, was to bind together and concentrate considerably more abundant investments from other sources on more important R&D undertakings which open up prospects for development of the economy. It is obvious that the resources of communities for science have not played that initiating role according to their original purpose. One of the reasons was the falling off of the income of scientific research organizations, which as a consequence have turned more to SIZ [self-managing community of interest] funds merely in order to maintain their existence.

According to figures for Serbia proper, total investments in scientific research dropped from 1.49 percent of national income in 1976 to 1.36 percent in 1980, though planning documents covering that period set forth the goal of bringing this investment up to 2 percent. Over that same period the share of funds appropriated through contributions dropped from 0.35 percent to 0.28 percent. These funds have the status of social service expenditures, which is why in annual balance sheets they are restricted on the basis of the estimated inflation. It has turned out that the estimates of inflation at the beginning of the year have not as a rule been realistic as to the outcome which would emerge at the end, and the restrictive policy toward outlays for science have been more consistent than toward certain other outlays appropriated in the same manner. Thus even the rate of the contribution has been dropping from 0.69 percent in 1975 to 0.44 percent in 1980 and 0.42 percent last year, adapting to the limited level of the total funds which can be spent. The approach for this year has been altered somewhat in that last year's rate of the contribution was established, and the amount of funds was exempted from the restriction. However, the consequences have been felt in the income of a large number of research organizations.

According to data of the Permanent Conference of Scientific Research Organizations of Serbia, income in 255 OOUR's [basic organization of associated labor] has been increasing considerably more slowly than costs (by 13 percentage

points). Moreover, there has been a considerably faster growth of income from the sale of products, from project planning, and from specialized and routine functions, than from research work. Obligations charged to income have been approximately the same as the appropriation to bolster plant and equipment.

The operating results have had a decisive impact on the possibility of rejuvenating staffs of research scientists. In 1980 these organizations hired only 120 researchers who had just completed their studies. The growth rate of employment in the sector of science was only 0.9 percent in the 1975-1980 period, while in the other so-called social services it was three- to fourfold higher. Institutes have become an unattractive place for young people, and therefore the average age of researchers employed in them is rising.

The purchase of equipment for research and experimental development is hampered by special restrictions. The Law on Temporary Prohibition of Noneconomic and Nonproduction Investment Projects, enacted at the outset of 1980, has made it considerably more difficult to purchase equipment. According to figures of the Social Accounting Service, only 97 million dinars were spent that year for scientific research equipment, and 117 million dinars for structures. Research organizations were able to spend only 1.7 percent of gross income for equipment. In the world at large 10-20 percent of total investments in scientific research is spent to purchase equipment, since scientific equipment quickly becomes obsolete and is relatively expensive. The importance of equipment is especially manifested in the phase of experimental development, where a major share of total outlays for R&D is spent, 80-90 percent according to certain calculations. Though last year investment in scientific equipment was exempted from the prohibition, many problems have remained in connection with the very rapid rise of prices, the temporary prohibition on imports, and the limited foreign exchange. It should be mentioned that equipment for research and experimental development is mainly imported, since it is not manufactured in our country.

Absence of the Necessary Incentives

Advancement of R&D and creation of conditions for a greater contribution of the scientific potential that has already been created to technological development and to raising economic efficiency--in line, of course, with the level of development attained and objective possibilities--requires a change of approach and different specific measures in development policy. In that respect many incentives which have been absent up to now, giving way to restrictive measures to "restrain expenditure," have yet to be introduced. The undifferentiated treatment of scientific research as consumption especially hurts that scientific research which by its nature is related to improvement of technology or new product development.

It is understandable that the application of scientific advances to development depends incomparably more on the economy, on the conditions for creation of income and for development of economic organizations, than it does on the scientists who by the nature of the work itself must have guaranteed stable conditions for continuous work. The thought now--this is an idea which was also given room in the draft of the agreement on strategy of technological

development we have mentioned--that it would be worthwhile to establish the obligation that organizations of associated labor set aside a required portion of income to be pooled for funding scientific research programs. Were conditions to remain unchanged, this solution could result in nothing more than a new parallel contribution.

The funds which the OUR sets aside as the required contribution for science appear from its point of view to be an expenditure, and it is understandable that it strives to minimize that expenditure along with all others. All other funds which the OUR sets aside for R&D to promote its own production are at present exposed to the same treatment as appropriations for its own consumption, and they are indeed taxed as such. Restricted opportunities for investment in laboratory equipment and installations for experimental development and trial production are an additional burden. Yet this is precisely that phase in the chain of the innovative process that requires incomparably more investments than are needed for basic and applied research. Incidentally, it is well known that knowledge which results from basic and applied research is by its nature public property and is in circulation through easily accessible channels. The essential thing is the ability to develop on the basis of that knowledge new technologies which will be expressed in the price and quality of the product.

The scanty accumulation of industry discourages the OUR in advance from undertaking the risk of a development project which could fail and which requires many years of work and large investments. The basic problem, then, is to find incentives which will arouse the real interest of production organizations to appropriate and to pool funds for R&D undertakings which carry a high degree of risk. The first step would be exemption of outlays for scientific research from tax charges regardless of whether the OUR makes the expenditures in its own laboratories or remits the funds for a specific purpose to a specialized scientific research organization. Mechanisms for the credit financing of trial production and new production resulting from internal R&D are not even yet in the offing in our system, but such mechanisms are very elaborate in countries with a market economy. Nor have material incentives to encourage inventive activity been worked out. Innovations are encouraged mostly with nonfinancial recognition, and this is moreover restricted mainly to the results of individuals, while the possibilities for increasing one's income on the basis of innovations remain theoretical. Yet we cannot expect the economy to show greater interest in R&D so long as income depends more on approved prices, the situation for the supply of industrial goods, a monopoly position on the local market, or conditions for obtaining foreign exchange than they do on productivity, on reduction of costs and on improvement of product quality.

Share of the Republics and Provinces in 1970 and 1979

Republics	Social Product		Population		Employment		Researchers		Investment	
	1970	1979	1970	1979	1970	1979	1970	1979	1970	1979
Bosnia-Herce-govina	12.3	12.2	18.1	18.8	13.5	14.2	8.4	10.7	6.7	9.5
Montenegro	2.0	1.8	2.6	2.7	2.0	2.1	0.9	0.8	0.8	0.6
Croatia	26.6	26.1	21.7	20.7	25.1	24.4	25.5	24.4	23.8	24.3
Macedonia	5.6	5.7	8.0	8.4	6.7	7.3	5.0	4.0	4.4	2.7
Slovenia	16.3	16.9	8.4	8.2	14.2	13.9	18.4	21.7	23.2	22.3
Serbia proper	24.7	24.9	25.6	25.0	25.3	25.3	37.5	34.6	35.4	32.5
Kosovo	2.1	2.0	6.0	7.1	2.6	3.0	0.8	1.2	1.5	0.8
Vojvodina	10.3	10.4	9.6	9.1	10.6	9.8	3.5	2.6	4.2	7.3

Commitment of Researchers and Resources Per Project, in thousands of dinars

Type of Institution		Natural Sciences	Engineering Sciences	Biotechnical Sciences
Institutes	Resources	592	932	749
	Researchers	0.7	0.8	0.8
Units	Resources	1,282	632	56
	Researchers	4.0	1.0	1.0
Universities	Resources	218	554	636
	Researchers	2.0	2.0	1.5

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